

ABSTRACTS OF CURRENT LITERATURE

Radionuclide Evaluation of the Systolic Blood Pressure End Systo-Volume Relationship—Response to Pharmacologic Agents in Patients with Coronary Artery Disease. R. Slutsky, J. Watkins, D. Castella; Vets. Adm. Medical Center, San Diego, CA. *Am Heart J* 105:53–59, 1983

The end-systolic blood pressure (EBP)/end-systolic volume (ESV) may provide preload independent information about the contractile state of the left ventricle. The responsiveness of this relationship to pharmacologic agents has never been tested in patients with coronary heart disease (CHD). To assess the response of the slope and intercept of the EBP/ESV relationship to dobutamine, propranolol, and nitroglycerin by means of radionuclide angiography in 21 patients with CHD, each individual was studied during the infusion of phenylephrine twice, once as a control and the second time after the administration of either i.v. dobutamine, propranolol, or topical dobutamine. Eight patients received 10 $\mu\text{g}/\text{kg}/\text{min}$ of dobutamine, which reduced resting cardiac volumes, raised ejection fraction (EF), and shifted the slope and pressure intercept (11.1 ± 3.8 to 17.1 ± 4.4 mm Hg) of the pressure-volume relationship. Five patients received 2 in. of nitroglycerin ointment. Nitroglycerin increased EF and reduced volumes but did not alter the slope or intercept of the relationship. Eight patients received 15 mg of propranolol. Propranolol reduced resting EF, increased volumes, and reduced both the slope and the intercept of the pressure-volume relationship. It was concluded that SBP/ESV relationship can be utilized to assess inotropic intervention, particularly when pharmacologic interventions are used.

Prospective Evaluation of Radionuclide Angiography for the Diagnosis of Coronary Artery Disease. E. H. Austin, F. R. Cobb, R. E. Coleman, R. H. Jones; Duke University, Durham, NC. *Am J Cardiol* 50:1212–1216, 1982

The sensitivity and specificity of rest and exercise angiocardigraphy (RNA) in the detection of coronary artery disease (CAD) was determined in a prospective study of 221 patients, using a first-pass technique and bicycle ergometry exercise testing. Four criteria were used for the detection of CAD: resting left ventricular ejection fraction (LVEF) <0.50 ; exercise ejection fraction (EEF) 0.06 less than predicted; increase in end-systolic volume >20 ml with exercise; and an exercise-induced wall motion abnormality. The criterion with the highest specificity, 0.98, was resting LVEF <0.50 , but sensitivity was only 0.23. Less than predicted EEF had specificity of 0.63 and sensitivity of 0.73. Increase in end-systolic volume of 20 ml with exercise in patients with resting LVEF >0.50 showed a specificity of 0.90 and sensitivity of 0.50. Exercise-induced wall motion abnormality had specificity 0.79 and sensitivity 0.61. Using all four criteria, 87% of patients with CAD were correctly identified. No patient with left main coronary stenosis and only four of 65 with three-vessel disease were missed. Specificity was only 0.54 overall and considerably lower (0.45) in women compared with men (0.63). Predictive value of the test also varied, with 82% of men correctly classified and only 63% of women. Rest and exercise RNA appears to be of limited value as a diagnostic test in women but is recommended for use in men with chest pain before cardiac catheterization.

Left and Right Ventricular Function at Rest and During Bicycle Exercise in the Supine and Sitting Positions in Normal Subjects and Patients with Coronary Artery Disease—Assessment by Radionuclide Ventriculography. D. E. Manyari, W. J. Kostuk; Univ. Calgary, Calgary, Alberta, Canada. *Am J Cardiol* 51:36–42, 1983

To evaluate the hemodynamic influence of posture during radionuclide ventricular studies, rest and exercise cardiac-gated blood pool scintigraphy (CGBPS) was performed in the supine and sitting positions in 22 normal subjects and in 20 patients with coronary artery disease (CAD). In normal subjects the left ventricular ejection fraction (LVEF) was higher in the sitting position both at rest ($67 \pm 6\%$ compared with $64 \pm 5\%$) and during exercise ($79 \pm 9\%$ compared with $76 \pm 6\%$). LV end-diastolic volume (EDV) in the sitting position was small at rest, but this variable was similar in both positions during exercise. LV end-systolic volume (ESV) was smaller in the sitting position both at rest and during exercise. LVEDV increased from rest to exercise in the sitting position, $31 \pm 23\%$ and in the supine position by $6 \pm 22\%$. In the patients with CAD, similar LVEF in both postures were found at rest and during exercise. Mean LVEF decreased by 2.1% in the supine position and 1.1% in the sitting position, with 17 of the 20 patients failing to have an increase of $\geq 7\%$. In 18 patients, LVEF response to exercise was concordant in the two postures. LVEDV in the sitting posture was smaller at rest by $16 \pm 22\%$ and during exercise by $8 \pm 18\%$. Sitting LVESV was smaller by $18 \pm 20\%$ at rest and by $14 \pm 21\%$ during exercise. LVEDV increased from rest to exercise in the sitting position by $45 \pm 36\%$ and in the supine position by $32 \pm 51\%$. It was concluded that despite a significant difference between the hemodynamic responses at rest and during exercise in the sitting and supine positions, the usefulness of rest-exercise CGBPS in detecting patients with CAD is similar in both positions.

Uptake of ^{67}Ga in the Heart of Rats Treated with Isoproterenol. T. Sasaki, S. Kojima, A. Kubodera; Teikyo University, Suarashi 1091-1, Sagami-ko-machi, Toku-gun, Kanagawa 199-01, Japan. *Eur J Nucl Med* 7:545–548, 1982

Ga-67 citrate accumulation and enzyme activities were monitored for ten days after the induction of infarct-like lesions in rat hearts. The study was formed by a control group (60 rats), which received only Ga-67 citrate, and a second group of 30 rats, which were treated with isoproterenol (ISP) for myocardial infarct induction before Ga-67 citrate injection. Groups of five rats each were killed at 0.5, 1, 2, 3, 4, and 10 days after ISP injection. Ga-67 uptake in heart, liver, and kidneys, serum creatinine phosphokinase (CPK), glutamate oxalacetic transaminase (GOT), glucose-6-phosphate dehydrogenase (G-6-PDH), and acid mucopolysaccharide (AMPS) concentrations were measured in vitro. Maximum Ga-67 uptake was achieved within one day after ISP treatment and decreased steadily over the next three days to background values. CPK and GOT (serum activity) reached a maximum 12 hr after ISP injection and decreased rapidly to normal values within the next 12 hr. Maximum activities of G-6-PDH and AMPS were achieved at the first day. The activity of each returned to the control level ten days after ISP treatment. CPK

and GOT activities represented the myocardial necrosis, whereas Ga-67 accumulation was associated with the repair phase. Ga-67 activity pattern was similar to those of G-6-PDH and AMPS. Thus AMPS might be a receptor for Ga-67 during the repair phase after myocardial infarction.

Binding of ^{99m}Tc -Gluconate to Heart Mitochondria. D. Galaris, M. Grandinson, U. Söderlund, N-E. Ahlberg, J. Rydström; University of Stockholm, Stockholm, Sweden. *Eur J Nucl Med* 8:4-9, 1983

Tc-99m gluconate is one of the complexes known to concentrate in acute ischemic myocardium. It was recently shown that a preferential binding of the radioisotope complex to the mitochondria exists. The authors investigated the potassium cyanide-induced enhanced binding of Tc-99m gluconate to mitochondria of ischemic rat and beef hearts. The study demonstrated that the enhanced binding of radionuclide was mainly localized to the inner mitochondrial membrane. Other organelles, e.g., nuclei, also showed a considerable binding of the isotope. Boiling, lipid extraction, or addition of N-ethylmaleimide results in a variable inhibition. The addition of sodium azide or carbon monoxide, two other inhibitors of the respiration cycle, failed to stimulate the binding of Tc-99m gluconate. Fractionation of submitochondrial particles indicated that the Tc-99m gluconate binding component cofractionated with cytochrome oxidase. The authors suggest that a protein component localized in the inner mitochondrial membrane, possibly cytochrome oxidase, is responsible for the binding of Tc-99m gluconate.

High Radio-Isotope Uptakes in Patients with Hypothyroidism. J. Wing, W. J. Kalk, C. Ganga. Peart St., Laudium, South Africa. *South African Med J* 62:892-893, 1982

These authors studied eight female patients (age 11-75 yr) having classic clinical hypothyroidism. Six of the patients had small-to-moderate, firm, asymmetrical goiters. Positive antimicrosomal and antithyroglobulin antibody titers were present in eight and in five patients, respectively. All patients had elevated (some markedly) serum thyroid stimulating hormone (TSH) concentrations. However, five patients (Group 1) showed subnormal serum total thyroxine (T_4) and subnormal free thyroxine index (FTI), whereas three patients (Group 2) had T_4 and FTI values in the low normal range. Of six patients receiving Tc-99m (and imaged at 20 min), five showed elevated thyroid uptake and one was in the high normal range. Of three patients receiving I-131 iodide (and imaged at 24 hr), one patient had an elevated uptake (also with Tc-99m), and two had high normal values. A clinical diagnosis of thyroid failure due to Hashimoto's disease was made in all patients. Radioisotope uptake by thyroid ranged from high normal to elevated in spite of evidence of either clinical and biochemical thyroid failure (Group 1 patients) or compensated biochemical euthyroidism (Group 2 patients). The authors speculate that the elevated Tc-99m uptake may reflect a normal or supra-normal iodide-concentrating mechanism despite the presence of hypothyroidism and low serum T_4 . The authors conclude that elevated radioisotope uptake by the thyroid is compatible with the hypothyroidism of Hashimoto's disease.

Thyroid Function and Continuous Ambulatory Peritoneal Dialysis. C. G. Semple, G. H. Beastall, I. S. Henderson, J. A. Thomson, A. C. Kennedy; University Department of Medicine, Royal Infirmary, Glasgow, UK. *Nephron* 32:249-252, 1982

Continuous ambulatory peritoneal dialysis (CAPD) is being used increasingly as an alternative to hemodialysis (HD). Better biochemical control and higher hemoglobin levels are achieved and clearing of 'middle molecules' (500-5000 daltons) is more efficient

with CAPD. Thus T_3 and T_4 , considered as 'middle molecules' in terms of size, might be removed from the circulation as well. Eight patients on HD and the same number on CAPD were included in the study. Creatinine, T_3 , T_4 , TSH, and fT_4 levels were measured before dialysis. Additional TSH concentrations were analyzed before and after the injection of 200 μg TRH. The HD and CAPD groups had low T_3 (HD— 1.38 ± 0.13 nmole/l; CAPD— 0.92 ± 0.07 nmole/l) and T_4 (HD— 66.0 ± 8.0 nmole/l; CAPD— 70.7 ± 6.5 nmole/l) levels. T_3 was significantly lower in CAPD than in the HD group. fT_4 and TSH were within the euthyroid range for both groups, but fT_4 was significantly decreased when CAPD patients were compared with the normal range. The $T_4:T_3$ ratio was higher in patients with CAPD. The TRH stimulation test demonstrates no significant difference between the HD and CAPD group. While CAPD may improve control of some biochemical and hematological parameters as compared with HD, it does not have a beneficial effect on thyroid function.

A Comparative Study of ^{99m}Tc and ^{131}I in Thyroid Scanning. G. Szonyi, P. Bowers, S. Allwright, G. Ellis, J. Wixman, R. Cooper, I. Hales; Royal North Shore Hospital, St. Leonards, Australia. *Eur J Nucl Med* 7:444-446, 1982

The most commonly used radionuclides in thyroid scanning are Tc-99m, I-131, and I-123. Several studies have reported discrepancies between technetium and iodine scans. The authors compared Tc-99m and I-131 thyroid scans in a prospective study. Forty-six patients with palpable thyroid nodules were referred for thyroid scanning. Ten min after i.v. injection of 200 MBq Tc-99m, anterior and oblique gamma camera images were obtained. Then each patient received orally 2 MBq I-131, and a repeat scan was obtained 24 hr later. Pathology reports were available in 25 patients who underwent surgery. Identical results were obtained in 43 cases (93.5%) with both imaging procedures. One patient had a functioning nodule and a photopenic nodule on the Tc-99m scan, whereas both nodules showed function with I-131. At surgery a benign multinodular goiter was found. Another patient with a multinodular goiter showed nodules with no uptake of Tc-99m but demonstrating functions with I-131. The third patient had a localized nuclide accumulation with Tc-99m, but the same mass showed no uptake when scanned with I-131. At surgery this patient was found to have a trabecular carcinoma. The uptake of Tc-99m by a thyroid nodule may be related to the thyroid metabolism involving trapping, but organification, storage, or release of thyroid hormone are not really represented by Tc-99m scanning. I-131, however, demonstrates all metabolic pathways of iodine. Hence, any intrathyroidal tissue that possesses the transport or trapping mechanism but not the later steps will appear functioning on a technetium scan but show no uptake on I-131 scan. The authors conclude that Tc-99m should be used first for the assessment of the thyroid gland. If palpable nodules accumulate the radionuclide, an iodine scan should be performed to exclude a photopenic nodule and potential malignancy.

Radionuclide Bone Scan in Neuroblastoma. M. A. Heisel, J. H. Miller, B. S. Reid, S. E. Siegel; Children's Hosp. Los Angeles, CA. *Pediatrics* 71:206-209, 1983

Fifty-one children with neuroblastoma were evaluated by bone scintigraphy, physical examination (PE), or radiography, or by both PE and radiography. In the initial evaluation of 32 children, 29 of the 32 patients (91%) had primary tumors diagnosed by bone scintigraphy compared with 63% by PE, 72% by radiographs, and 88% by PE and radiographic studies together. Three bone scintigraphs failed to demonstrate abnormal uptake of radiopharmaceuticals in the area of primary tumor at the time of diagnosis,

and in none of these patients was a radiographic study positive for a primary tumor. In evaluation of the extent of bony metastatic disease, 45 patients had a total of 70 bone scintigraphs and skeletal surveys obtained at the time of diagnosis and during therapy to evaluate metastatic disease. In twenty-four studies (34%), both radiographs and bone scintigraphs were negative. In 10 cases (14%) the bone scintigraphs were positive and skeletal survey negative; in five cases (7%) the radiographs were positive and bone scintigraphs were negative. In 31 cases (44%) both radiographs and scintigraphs were positive; in twenty-six of thirty-one studies bone scintigraphy showed more positive areas. The authors concluded that bone scintigraphy appears to be the best single specific test in neuroblastoma for localizing the primary tumor and monitoring extent of disease.

Location and Activity of Ulcerative and Crohn's Colitis by Indium-111 Leukocyte Scan. A Prospective Comparison Study. D. T. Stein, C. M. Gray, P. B. Gregory, M. Anderson, D. A. Goodwin, and I. R. McDougall; Stanford Univ. Med. Ctr., Stanford, CA. *Gastroenterology* 84:388-393, 1983

Fifteen patients (ten with ulcerative and five with Crohn's colitis) underwent In-111 leukocyte scan, and the locations of radiiodine uptake in the colon were correlated with other diagnostic modalities—barium enemas (13 patients), colonoscopy (three patients), surgery (two patients), or a combination of these. The correlation of disease location was excellent in 11 instances, good in two and poor in three. In two of the three studies where major disagreement occurred, the comparative barium enema was performed >2 mo after In-111 scan. Activity of disease, estimated by the intensity of radionuclide uptake, was compared with clinical disease activity assessed by the Crohn's Disease Activity Index (mild, moderate, moderately severe, severe) for both forms of colitis. The clinical assessment and indium scan grading correlated well ($r = 0.81$). Authors concluded that the In-111 leukocyte scan appears to have greater potential in assessing the activity and extent of Crohn's and ulcerative colitis.

Pelvic Lymphoscintigraphy with ^{99m}Tc -Colloid in Lymph Node Metastases. T. Iversen, M. Aas; Norwegian Hospital, Oslo, Norway. *Eur J Nucl Med* 7:455-457, 1982

The authors assessed the diagnostic value of lymphoscintigraphy in 24 patients with cervical cancer in stage Ib. All examinations were done just before surgery. Five hours after the superficial injection of Tc-99m colloid (46.9 ± 7.6 MBq) in the subcutaneous tissue of the labium majus, images from the pelvic region and the upper abdomen were made. Next day radical hysterectomy with transperitoneal pelvic lymphadenectomy was performed. The pelvic lymph nodes were removed in separate groups, and the activity of the lymph nodes was measured in a counter. The specimens were then examined by a pathologist who registered the number of lymph nodes in the different regions and the location of metastases. Four patients had lymph node metastases in the external chains, and in one patient the para-aortic region was also involved. In these patients the lymphoscintigrams did not differ from those of patients without metastases. The in vivo measurements of radioactivity did not show significant diagnostic differences between the normal and metastatic lymph nodes. In one patient two metastatic lymph nodes had a higher activity than the corresponding lymph nodes without cancer. The authors conclude that involved lymph nodes accumulate radionuclide as normal nodes do and that the diagnostic value of lymph node scanning is therefore limited. Lymphoscintigraphy might be helpful for localizing lymph nodes under surgery if an appropriate detector is used.

Radioimmunoassayable Prostate-Specific Acid Phosphatase in Peripheral and Bone Marrow Sera Compared in Diagnosis of Prostatic Cancer Patients. P. Vihko, M. Kontturi, O. Lukkariinen, R. Vihko, (Edit. Comment—J. E. Pontes); Univ. Oulu, Oulu, Finland. *J Urol* 128:739-741, 1982

Assay of bone marrow acid phosphatase has been advocated to increase accuracy in staging prostatic cancer, but several investigators have reported a high rate of false positives by conventional chemical methods. These authors modified an existing radioimmunoassay (RIA) to measure prostate-specific acid phosphatase (PSAP) in serum derived from blood drawn either from an antecubital vein (peripheral) or from bone marrow aspirate obtained from the posterior iliac crest under local anesthesia.

The patients studied were 20 men, age 55-72 yr, with histologically confirmed benign prostatic hyperplasia, Group A; 45 men, age 62-78 yr, with histologically confirmed prostatic carcinoma, 27 of whom had untreated disease without bone metastases, Group B; 11 men who had bone metastases, Group C; and seven men who were receiving hormonal therapy, Group D. In Group D, PSAP in peripheral and bone marrow sera was within normal limits in all subjects. Of 27 Group B patients, PSAP was elevated in peripheral sera in 20; and in 21 the PSAP was elevated in bone marrow sera. (Twenty-one of those 27 patients had extracapsular tumors, and PSAP was elevated in peripheral sera of 16 and in the bone marrow sera of 17 of these.) All 11 patients in Group C had elevated PSAP in both peripheral and bone marrow sera. Of the seven Group D patients, PSAP was elevated in both peripheral and bone marrow sera from the same five patients. These authors conclude that (a) RIA did not yield false-positive PSAP values in either peripheral or bone marrow sera, and (b) bone marrow sera (which are difficult to obtain) yield PSAP values that provide no diagnostic information beyond PSAP values obtained from peripheral sera.

Elevated Serum Free Thyroxine by Thyroxine Analog Radioimmunoassays in Euthyroid Patients with Familial Dysalbuminemic Hyperthyroxinemia. R. Rajatanavin, L. Fournier, D. DeCosimo, C. Abreau, L. E. Braverman; University of Massachusetts, Worcester, MA. *Ann Intern Med* 97:865-866, 1982

Familial dysalbuminemic hyperthyroxinemia (FDH) is characterized by elevations in serum thyroxine (T_4) and in free T_4 index due to an abnormal serum albumin that preferentially binds T_4 . Such patients are clinically euthyroid and have normal serum-free T_4 by equilibrium dialysis. These authors measured free T_4 in serum from 19 patients with FDH and from 20 euthyroid volunteers by each of five different commercial radioimmunoassay (RIA) kits: antibody-coated microfine silica (A); microencapsulated antibody (B); two-step antibody-coated tube (C); one-step I-125- T_4 (D); and one-step I-125- T_4 analog (E). Only Kit B gave identical values for serum-free T_4 in patients with FDH and euthyroid volunteers. All values for free T_4 in patients with FDH by Kits A, B, and C were in the normal range; however, mean serum-free T_4 indicated by Kits A and C in such patients was significantly higher than that in the volunteers. Kits D and E (which contain a radiolabeled T_4 analog rather than radiolabeled T_4) indicated markedly elevated (abnormal) serum-free T_4 in all 19 patients (Kit D) and in 18 of 19 patients (Kit E). In contrast, Kits D and E performed satisfactorily when quantifying serum-free T_4 in euthyroid volunteers. These authors caution that certain RIA kits may indicate artifactually elevated (abnormal) serum-free T_4 in euthyroid patients having FDH.

Early Urinary Pregnancy Testing: Correlation with Serum-Beta-HCG Radioimmunoassay. S. L. Corson and F. R. Batzer; John Hopkins University, Baltimore, Md. *J Reprod Med* 27:725-728, 1982

These authors measured human chorionic gonadotropin (HCG)

levels in 104 women being seen in an infertility practice. First, a commercial tube macrofloculation system (performed according to manufacturer's instructions) and a related (but less sensitive) slide system were used on 122 first morning urinary specimens. Simultaneously, serum was drawn and evaluated for beta-subunit of HCG by radioimmunoassay (RIA), the most sensitive method, using an established procedure. Many of the patients were receiving artificial insemination (donor or husband) therapy. Some received ovulation-induction therapy with clomiphene and/or exogenous HCG (latter not affecting later-measured endogenous levels). All urine and serum samples were evaluated daily from 14–21 days after the thermal nadir (assumed ovulation) of basal body temperature. Of the 104 patients tested, 18 had negative HCG by RIA as well as by tube and slide methods over the period studied. In the resulting 86 pregnancies—61 singleton pregnancies, two twin gestations, one set of triplets, 20 patients with positive serum HCG who aborted before completion of first trimester, and two patients with tubal gestations—urinary tube assays were positive 50% of the time by day 14, increasing to 86% of the time by day 21. The tube test was found to be almost three times more sensitive than the slide test. Serum HCG rose logarithmically from day 14–21 postovulation, often in the face of concomitant negative urinary HCG by the tube method. The authors found that freezing the urine samples before testing altered results in the tube and slide assays, but that refrigeration had no effect. The authors did not investigate possible effect of refrigeration or freezing on serum HCG results by RIA.

Changes in Active and Inactive Renin with Haemodialysis. R. Thatcher, J. A. Whitworth, S. L. Skinner; University of Melbourne, Victoria, Australia. *Nephron* 32:214–221, 1982

Renin has been known to exist in multiple forms and the inactive form accounts for about 80% of total plasma renin in normal subjects. The authors evaluated the relationship between active and inactive renin in 70 patients on chronic maintenance hemodialysis with either two ($n = 51$), one ($n = 15$), or no ($n = 4$) kidneys in situ. None of the patients received antihypertensive drugs. A significant relationship ($r = 0.593$) between active (APRC) and inactive plasma renin concentrations (IPRC) was found before dialysis. No significant correlation existed between APRC and blood pressure during dialysis. APRC and IPRC were not altered by heparinization nor did activation of renin by the dialyzer occur. Dialysis up to 3 kg body weight reduction did not significantly raise APRC or IPRC levels.

An Overview of a Camera-Based SPECT System. K. L. Greer, R. J. Jaszczak, R. E. Coleman; Duke University Medical Center. *Med Phys* 9:455–463, 1982

A number of different approaches have been developed to perform single-photon emission computed tomography (SPECT). This article describes a system that utilizes two large-field, opposed scintillation cameras equipped with on-line hardware spatial linearity and uniformity correction circuits. The cameras rotate about the patient in continuous motion to provide an averaging of all spatial frequencies. With this system, SPECT studies require essentially the same time as does planar imaging. X gains and offsets in the two detectors are calibrated automatically; Y gains are set less frequently using manual techniques. Although medium-energy and fan-beam collimators are available, most of the studies are performed with general purpose collimators. A high count (40–50 million counts) flood is taken daily to provide a multiplicative correction for residual nonuniformities in the field and prevent the appearance of ring artifacts. Reconstructions are performed using filtered backprojection and attenuation correction is generally done using depth information from body contours. There are two dif-

ferent methods to obtain the body contours. One utilizes the detection of scattered photons from Tc-99m but gives images that are larger than an image made from primary photopeak data. The other utilizes a line source of Xe-133 to sample photons but requires refilling and interferes with pharmaceuticals that emit low-energy photons, such as Tl-201. However, the latter method is successful when the scatter method isn't, e.g., in cases where photon energy is high enough to produce septal penetration. Although a two-step procedure incorporating error views has been used to correct for attenuation, first-order correction using a constant attenuation coefficient is accurate enough for most applications, including quantification. High-quality, artifact-free images have been obtained with this system. Experimental studies confirm system linearity and the ability to measure accurately volumes and concentration ratios in objects greater than 2 cm in diameter. The authors feel this property could be useful in assessing tumor size and determining regional blood flow.

Course on Digital Image Processing. R. E. Twogood, F. G. Sommer; *IEEE Trans Nucl Sci NS29*:1076–1086, 1982

This is a tutorial overview of digital image processing techniques with the focus on image enhancement rather than removing some known distortion from an image. Operations used to enhance images are broken into three groups and algorithms are presented from each group. The first group consists of point operations where each pixel in the processed image is determined by a single pixel from the unprocessed image. Some point operations are arithmetic combinations of images, grey scale manipulations, and pseudocolor mapping. The second group consists of neighborhood operations where each pixel in the processed image is determined by a local neighborhood of pixels in the unprocessed image. Many of these are convolution-type operators, and they include low-pass and high-pass filtering, unsharp masking, and derivative operations. Each operation is discussed in terms of the image features that will be suppressed or enhanced. Other neighborhood operations discussed are median filtering and contrast stretching. The third group consists of global operations where each pixel in the processed image is determined by all or most of the pixels in the unprocessed image. These operations take the form of two-dimensional transformations, such as the fast-Fourier transform. Other transforms are mentioned.

The article is not directed specifically toward nuclear medicine. Problems such as quantum, noise, and loss of resolution and sensitivity with depth are not addressed. The article is a good tutorial overview of the field with a clear presentation of the basic concepts.

Estimation of Age-Dependent Internal Dose From Radiopharmaceuticals. K. Henrichs, A. Kaul, and H. D. Roedler; Bundesgesundheitsamt, Neuherberg, FRG. *Phys Med Biol* 27:775–784, 1982

Currently, the mean absorbed dose estimates per unit cumulated activity for the most important radionuclides are calculated only for the ICRP adult reference man. Alterations in these estimates with age occur because of changes in the mass, size, shape and separation of the organs as well as by changes in the metabolic behavior of the radiocompound. The authors investigated three methods of calculation of these estimates. The first used an approximate method whereby the coordinates of the center of the organ masses were transformed by dimensions of the trunk; second, transformations were applied to the center of masses using an age-dependent anthropomorphic model; and finally Monte Carlo techniques were applied to the age-dependent model.

They concluded that the present methods of modifying absorbed doses by age-dependent models are sufficiently accurate, and at worst, overestimate the specific absorbed fraction for active bone

marrow by a factor of four. They felt the differences in dose estimates are minor compared with the unknown variability that occurs with age of the metabolic parameters.

Two-Orthogonal-View Method for Quantification of Rad Dose to Neck Lesions in Thyroid Cancer Therapy Patients. K. F. Koral, R. S. Adler, J. E. Carey, R. C. Kline, W. H. Belerwaltes; University of Michigan Medical Center. *Med Phys* 9:497-505, 1982

Many clinicians now use Anger scintillation cameras fitted with a pinhole collimator for imaging the thyroid gland; however, use of the pinhole collimator complicates the determination of organ depth and size. This paper presents a method to estimate volume and to calculate lesion radiation absorbed dose after the administration of therapeutic amounts of I-131. First, it is necessary to calculate the X and Y camera gain in the computer image in mm/matrix element by using an orthogonal hole pattern commonly used for quality assurance tests. Uptake measurements must also be corrected for variation of pinhole sensitivity with distance from the center of the detector, which is accomplished with a Ba-133 flood image. Anterior and lateral views of the thyroid are then taken using the pinhole collimator. Because the image is magnified, an edge-detection algorithm can be used to quantify organ "size." Measurement of the magnification is accomplished by locating the relative position of the organ in three dimensions. The basic principle is that of taking two views of the patient, knowing the relative position of the detector for the two views. Although the authors used a rotating Anger camera for this study, manual rotation of a seated patient in a controlled manner could also be used. If the lesion is isolated in both views, the volume of the lesion can be estimated, together with an upper boundary; and the absorbed dose calculated using the MIRD formalism. The largest source of error is in the volume estimation.

Static and Real-Time B-Mode Sonography of Arterial Occlusions. G. A. W. Gooding, D. J. Effeney; University of California, San Francisco, Veterans Administration Medical Ctr., San Francisco, CA. *Am J Roentgenol* 139:949-952, 1982

The authors report both static and real-time findings in the examination of 110 patients. Twenty-three occluded arteries were identified manifesting three sonographically detectable patterns. A normal B-Mode appearance with absence of pulsation on real-time examination was seen in 18 of the 23 vessels; in four there was no detectable vascular channel, and in one the occluding thrombus was demonstrated. In static scans of the majority of vessels, therefore, the appearance of an occluded channel was indistinguishable from that of a patent one. Real-time imaging that failed to show pulsation provided the diagnosis of occlusion. The authors suggest that static B-Mode imaging of arteries should always be

accompanied by real-time examination and, when available, pulse Doppler studies. Representative scans are provided.

Changes in Placental Ultrasonic Appearance I: Incidence of Grade III Changes in the Placenta in Correlation to Fetal Pulmonary Maturity. R. W. Quinlan, A. C. Cruz, W. C. Buih, M. Martin; University of Florida College of Medicine, Gainesville, FL. *Am J Obstet Gynecol* 144:468-470, 1982

In a study involving 174 amniocentesis examinations for fetal pulmonary maturity, the authors found Grade III changes in the placenta in only 7%. Sensitivity of the placental grading system in predicting pulmonary maturity was only 5%, and a false prediction of fetal pulmonary maturity was encountered in 42% of patients with Grade III placental changes. Those pregnancies in which Grade III changes falsely predicted fetal pulmonary maturity were all complicated by maternal hypertensive disorders. Successful placental grading could not be accomplished in 24.1% of those studied because the placenta lay in a posterior implantation.

Changes in Placental Ultrasonic Appearance II. Pathologic Significance of Grade III Placental Changes. R. W. Quinlan, A. C. Cruz, W. C. Buih, M. Martin; University of Florida College of Medicine, Gainesville, FL. *Am J Obstet Gynecol* 144(4):471-473, 1982

Of a series of 48 pregnancies in which Grade III placental changes were detected, the authors encountered an incidence of 78% of significant perinatal problems when the findings were preterm. Hypertensive complications such as preeclampsia, 41%, and chronic hypertension, 15%, were encountered as well as a 27% incidence of intrauterine growth retardation. The authors suggest that the finding of Grade III changes in a placenta of a pregnancy suspected of being postdate will reinforce that clinical impression, and the unexpected finding of Grade III changes may well serve to predict the development of problems later in that pregnancy.

JOHN J. COUPAL
PEGGY A. DOMSTAD
ANDREW FRIED
WEI-JEN SHIH

University of Kentucky Med. Ctr.
and VA Hospital
Lexington, Kentucky

L. STEPHEN GRAHAM
Veterans Administration Hospital
Sepulveda, California

LUDWIG STRAUSS
Kunekum Mannheim
Mannheim, West Germany

AUDREY WEGST
University of Kansas Med. Ctr.
Kansas City, Kansas

WESLEY W. WOOTEN
VA Med. Ctr. and Utah Med. Ctr.
Salt Lake City, Utah

ERRATUM

In the article entitled "Absorbed Dose Estimates for Positron Emission Tomography (PET): C¹⁵O, ¹¹CO, and CO¹⁵O," November 1982, Volume 23, pp. 1031-1037, Table 3, p. 1034, contains an error for critical organ dose. For the spleen, Table 3 should read 91 mrad/mCi and 1365 mrad/15mCi for both bolus inhalation and bolus infusion. Text reference to these doses is correct.